EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 3-49

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-W-10-002	11/19/2009 To 09/19/2014 Base Option Period Number 3	Nutrient Reduction in the Watr

Contractor	Specify Section and paragraph of Contract SOW
INDUSTRIAL ECONOMICS, INCORPORATED	Pg 4 & 6, Sec III, Ele 1

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/20/2012 To 09/19/2013

Comments:
The purpose of this action is to initiate Work Assignment (WA) 3-49 which continues but does not duplicate work previously performed under WA 2-49. The Work Assignment COR is changed to Marilyn Tonbrink.

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations data use EPA Form 1900-69A

SFO (Max 2):

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
11/19/2009 To 09/19/2014		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Marilyn Tonbrink (Signature) (Date)	Branch/Mail Code: Phone Number: 401-782-3078 FAX Number:
Project Officer Name: Cheryl R. Brown (Signature) (Date)	Branch/Mail Code: Phone Number: 202-566-0940 FAX Number:
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Stefan Martiyan (Signature) 9/24/12 (Date)	Branch/Mail Code: Phone Number: 202-564-1987 FAX Number:

Work Assignment Form (WebForms v1.0)

WORK ASSIGNMENT

Title: Planning and Management Support for Innovative Application of Systems Thinking to Nutrient Reduction in the Watersheds of Southeastern Massachusetts and Rhode Island

Contractor: Industrial Economics, Incorporated (IEc) Contract No.: EP-W-10-002

Work Assignment Number: 3-49

Estimated Period of Performance: Date of issuance: to: 11/18/2012

Estimated Level of Effort: 750 hrs

Key EPA Personnel:

Work Assignment COR (WA COR):
Marilyn Tenbrink
U.S. Environmental Protection Agency
ORD/NHEERL/Atlantic Ecology Division in Narragansett, RI
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Contract Level COR:
Cheryl R. Brown
Office of Policy (1805T)
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Background and Purpose:

To promote the discovery and implementation of innovative approaches to nutrient reduction in New England, EPA will require technical support for multifaceted activities across the whole innovation cycle. The innovation cycle includes five different elements; however, this Work Assignment is solely for the first element of the innovation cycle: Planning and managing innovation.

Nature of the Problem to be Addressed by the Work Assignment

In applying innovation to solve EPA's challenging problems, EPA-New England is engaged in a variety of initiatives that are relevant to the pursuit of sustainability in the New England region. At the same time, and for the same reason, the Office of Research and Development (ORD) has been developing a holistic approach to sustainable solutions based on systems thinking. The timing of these parallel efforts provides an opportunity for ORD to assist Region 1 in articulating and implementing an integrated approach toward Regional sustainability in specific problem areas. The initial focus of this work is on the problem of nutrient impairment in New England waters and solutions that include total water cycle management in SE New England, and the aim of this pilot effort is to help avoid, reduce, and manage nutrient impacts to Narragansett Bay and

its watershed and also other SE New England watersheds.

Scope of the Work Assignment

As EPA undertakes this innovative engagement to address the specific problem described above, and to demonstrate the application of systems thinking to sustainability, EPA staff will require contractual support under this Work Assignment from experts in various activities, such as, but not limited to, the following:

- identification of key sustainability indicators—ecological, economic, and social—that are relevant to regional stakeholder groups,
- modeling of inter-related impacts and feedback loops among current and potential options to address the nutrient problem, and
- holistic assessment of expected benefits to the Region as a whole.

The expected outcome of this effort shall be a cohesive strategy for achieving progress toward nutrient management and/or reduction, encompassing overall environmental improvements as well as future economic and social development. The project shall not only support effective policy and decision making within EPA-New England, but can also serve as a model for other EPA Regions that are exploring similar challenges.

ORD has developed a scheme for systems thinking that expands upon the classic risk assessment and management paradigm and supports the realization of more sustainable solutions, including those based upon adaptive management. The System Characterization stage defines the scope and context of the system, identifies sustainability goals, and develops an integrated problem formulation. The subsequent stages of the process are Sustainability Assessment, involving analysis of alternative sustainable solutions, Sustainability Enhancement, involving implementation of the chosen intervention, and System Adaptation, involving progress monitoring and response to changing conditions and community goals. The process may require cyclical iterations to revisit prior decisions and to assure the resilience of both economic and ecological systems. Of course, stakeholder involvement throughout this process is a critical success factor.

The work assignment shall provide expert support for the first two stages of the above process, in order to establish the necessary knowledge and tools to support implementation of the latter two stages by EPA-New England personnel along with State and local partners. Information to be developed in the work assignment includes:

- Current baseline conditions for nutrient pollution, and potential adverse human or ecological impacts associated with impaired surface/coastal water and groundwater.
- Ecological and geophysical characteristics that influence nutrient impacts in the watershed, including the north-to-south gradient of impairments and unique local conditions that need to be considered.
- Important system characteristics, including point and non-point sources, fisheries

(current and planned), wastewater treatment technologies (including on-site and various scales of decentralized systems), storm water management, agricultural practices, and patterns and impacts of development, including infrastructure related to land use, transportation, climate change, and demographic changes.

- Identification of stakeholder groups with the aim of capturing diverse perspectives, including users, technical experts, and community leaders who can serve as early adopters and builders of innovative strategies.
- Establishment of key objectives and measurable indicators—environmental, economic, and social.
- Analysis of potential instruments for waterway nutrient reduction and impact mitigation, including narrative standards, numeric regulatory criteria, infrastructure improvements, voluntary reduction programs, economic incentives, innovative technologies, and other possible interventions by governmental or non-governmental organizations.
- Hidden implications of nutrient reduction strategies, e.g., product life-cycle consequences of regulatory restrictions and changes in practices.
- Relative risks, costs and benefits of alternative strategies, including anticipated system resilience in the face of changing economic patterns, demographics, climate, and other factors, and the distribution of those risks, costs, and benefits among various stakeholder groups.

As the Sustainability Realization process moves from the System Characterization to the Sustainability Assessment and Enhancement stages, analytic tools can be used to model the interactions among socioeconomic drivers, environmental pressures, and sustainability outcomes. One promising approach is the use integrated assessment modeling based on system dynamics, exemplified by the T21-Ohio model that is being applied to support energy and economic policy in the State of Ohio, as well as the global "green economy" model that was developed by the United Nations Environmental Programme.

The resulting Systems Dynamics model shall provide a holistic, aggregated analysis of the expected environmental, economic, and social consequences of different alternatives. However, the model shall also be capable of incorporating the results of more detailed analyses, such as finite-element simulations of nutrient impacts on water quality. The model shall have an interactive human interface that permits real-time investigation of different alternatives and key assumptions. Thus, we anticipate that this model shall be useful as a strategic tool in evaluating overall sustainability enhancement opportunities. At the same time, it shall represent an innovative research product that can be adapted to other watersheds in EPA-New England and elsewhere, and can be extended to perform broader analysis of sustainable solutions.

Tasks and Deliverables:

The contractor shall not duplicate work being performed under Work Assignment 2-40.

Practical Objectives

The main focus of this effort shall be on the System Characterization and Sustainability Assessment stages of Figure 1, laying the groundwork for Sustainability Enhancement decision making and longer-term System Adaptation. The specific objectives and tasks undertaken in this effort shall be the following:

- **EPA will** – Provide a guidance document describing the approach used for development of the graphical user interface in Java.
- **The Contractor shall** –modify and extend the existing user interface, or to design new versions of the interface using the same methodology.
- **EPA will** - Identify initial lists of the key issues, current conditions, concerned stakeholders, alternative interventions, potential sustainability indicators, and sources of information to support the investigation.
- **The Contractor shall** – Develop a detailed conceptual model to represent the subsystems, resource flows, and watershed issues of concern, and develop a corresponding system dynamics model using a standard commercial platform (e.g., VENSIM). The model shall support the approximate estimation of sustainability indicators at an aggregate watershed level, and provide an interactive human interface to support evaluation of alternatives and strategic decision making.
- **The Contractor shall** – Apply the model to the EPA list of intervention strategies and various combinations of those strategies to support the assessment of the potential contributions of current and potential nutrient reduction initiatives by EPA and other entities, thus revealing benefits, barriers, and potential synergies and/or conflicts among these initiatives.
- **The Contractor shall** – Identify important interdependencies and develop future scenarios that take into account the relationships between environmental improvement, future economic growth, and societal expectations in New England communities
- **The Contractor shall** – Develop and articulate options for a cohesive, systemic strategy for achieving progress in nutrient reduction, consistent with EPA's established programs and policies
- **The Contractor shall** – Building on this pilot effort, develop draft guidance for ORD and EPA-New England to deliver to other EPA Regions that wish to apply systems thinking for development of sustainable solutions to similar environmental challenges.
- **EPA will** - Identify specific decision support frameworks (including software tools or logical processes) currently in use within EPA or other organizations for purposes of sustainability assessment and management.
- **The Contractor shall** – Develop an approach for incorporating the above model into these decision support frameworks, and demonstrate the approach for at least one framework to be selected in consultation with EPA.

The WA COR shall review all deliverables in draft form and provide revisions and/or comments to the contractor. The contractor shall prepare the final deliverables incorporating the WA COR's comments.

The contractor shall at all times identify themselves as Contractor employees and shall not present themselves as EPA employees. Furthermore, they shall not represent the views of the U.S. Government, EPA, or its employees. In addition, the Contractor shall not engage in inherently governmental activities, including but not limited to actual determination of EPA policy and preparation of documents on EPA letterhead.

QUALITY ASSURANCE (QA) REQUIREMENTS

Check [X] Yes or [ ] NO, if the following statement is true or false. The Contractor shall submit a written Quality Assurance Project Plan for any project that is developing environmental measurements or a Quality Assurance Supplement to the Quality Management Plan for any project which generates environmental data using models with their technical proposal. This plan shall be submitted within 30 calendar days of receipt of work assignment.

Task 1 - Prepare Workplan (Incomplete)

The contractor shall prepare a workplan within 15 calendar days of receipt of a work assignment signed by the Contracting Officer. The workplan shall outline, describe and include the technical approach, resources, timeline and due dates for deliverables, a detailed cost estimate by task and a staffing plan. The WA COR and the PO and the CO shall review the workplan. However, only the CO can approve/disapprove, suggest revisions, or change the workplan. Official revisions shall be given to the contractor by the Contracting Officer. The contractor shall prepare a revised workplan incorporating the Contracting Officer's comments, if required.

Task 1 Deliverables:

1a. Workplan within 15 calendar days of receipt of work assignment.

1b. Revised workplan within 3 calendar days of receipt of comments from the Contracting Officer, if required.

1c. Quality Assurance plan within 30 calendar days of receipt of work assignment due to the WA COR.

Task 2 - Update and Operation of the System Dynamics Model (this work falls under Contract Statement of Work page 4 and 6, Section III, Element 1: Planning and management support, 1. Research) **(Incomplete)**

To support the Sustainability Realization process, ORD has developed a conceptual model that depicts resource flows and causal linkages among industrial, societal, and environmental systems. In order to focus on the nutrient problem, this model shall be customized into a more detailed, problem-specific form, showing the relevant ecosystem services, economic activities, waste streams, transport and fate mechanisms, and human or environmental consequences. This has resulted in a prototype System Dynamics model for Narragansett Bay watershed.

The contractor shall update the System Dynamics model based on a standard commercial platform for the Threshold 21 Model, with an interactive human interface to support evaluation of alternatives at an aggregate watershed level. The update shall focus on including additional areas of Southern Massachusetts in the model.

For purposes of analyzing nutrient-related policies and strategies, the model shall be capable of evaluating nutrient reduction alternatives for the 60 percent of the Narragansett Bay watershed that lies in Massachusetts and also the potential management options to meet up to 100% reductions in wastewater-nitrogen releases in other SE Massachusetts's watersheds. Rather than a detailed numerical simulation, this model shall provide a holistic, aggregated analysis of the expected environmental, economic, and social consequences of different alternatives. However, the model shall also be capable of incorporating the results of more detailed analyses.

The contractor apply the model to the EPA list of intervention strategies and various combinations of those strategies to support the assessment of current and potential nutrient reduction initiatives. The contractor shall use the model to examine relevant watersheds, such as those affecting Cape Cod, in order to perform a more complete assessment of current and potential management and reduction initiatives for the stakeholders in the region.

The contractor shall participate in the biweekly teleconferences (approximately 10) and face-to-face meetings at the Region 1 offices (approximately 3) and prepare meeting summaries to be distributed to the EPA project team.

Task 2 Deliverables:

2a. Provide an operational prototype of the updated System Dynamics model within 1 month after initiation of the WA for testing by EPA.

2b. Provide briefings during a week in July 2012 to the ORD and Program Office managers at the EPA facilities in Washington, DC on the "systems thinking", the development and use of the prototype Systems Dynamics model and applications of the model for the nutrients issue in southern New England.

2c. Provide training sessions during a week in August to EPA technical staff at the EPA facilities in RTP, NC. These sessions will allow the staff to acquire skills in using "systems thinking" and the modification and development of Systems Dynamics models for different

EPA issues and applications.

2d. Provide weekly reports of the results from the applications of the model in support assessment of current and potential nutrient reduction initiatives.

2e. Draft meeting summaries within 2 days after the end of the meeting due to the WA COR.

2e. Provide the final version of the summary within 2 days after receipt of EPA comments due to the WA COR.

Task 3 - Draft and Final Products and Report (this work falls under Contract Statement of Work page 6, Section III, Element 1: Planning and management support, 5. Reports) **(Incomplete)**

The products of this Work Assignment shall be the final version of the System Dynamics model; CDs containing detailed documentation and computer programs for the model(s) and data collected and used in the WA and detailed tables and figures describing the results of the different model applications; a guidance document, with tutorials, for EPA technical staff to use to apply systems thinking for sustainable solutions by use of this type of model; and a final WA report with appendices providing technical details of the work.

The contractor shall organize two hands-on training sessions for EPA technical staff to work with the prototype model and to learn how to apply "systems thinking" and models like the prototype to EPA issues.

The contractor shall organize up to two stakeholder public meetings, including securing facilities, managing the logistics, taking notes, providing a draft report of the meeting and following the additional guidance from the WA CORs, if provided. A Stakeholder Meeting is used to inform the Stakeholders about the work by EPA and its contractor pertaining to this work assignment. The Stakeholders are not invited as speakers or as a committee. They are invited as individuals. All of the Stakeholders coming to this meeting are local and shall not be traveling at EPA or contractor expense. The Stakeholders may participate in the open discussions, if they wish, and speak as individuals. The stakeholders shall be encouraged to provide comments in writing to EPA as individuals. These meetings shall occur in September or October 2012. About 25 stakeholders would be expected to attend each of the meetings

The contractor shall provide a draft final report describing the technical work performed and recommended options for nutrient reduction, with rationale. The report shall also include a description of other model applications and analysis that could be performed in the future and the potential benefit of doing this additional work. The report will also include a draft guidance document, with tutorials, for other EPA Regions and Offices to use to apply systems thinking for sustainable solutions by use of this model as the starting point.

Task 3 Deliverables:

3a. Provide a fully operational near-final model by the 15th of September and the final model within 10 days after receiving EPA comments meeting due to the WA COR.

3b. Draft Stakeholder Meeting reports within 5 calendar days after the end of workshop/meeting due to the WA COR.

3c. Update and finalize the Stakeholder Meeting reports from written comments from the stakeholders and EPA within 7 days of receiving them from EPA due to the WA COR.

3d. Provide a fully operational final model within 10 days after receiving EPA comments from the testing of the model meeting due to the WA COR.

3e. Provide a draft final report by October 15th 2012 due to the WA COR.

3f. Provide a final report incorporating EPA comments by November 9th 2012 2 due to the WA COR.

3g. Provide CDs containing detailed documentation and computer programs for the model(s) and data used in the WA and detailed tables and figures describing the results of the different model applications by November 13th 2012 due to the WA COR.